

REMARKS

Favorable reconsideration of this application is requested in view of the above amendments and the following remarks. Claims 14-20 are amended. Claims 14-20 are pending in the application, with claim 14 being the sole independent claim. The changes made to the claims by the current amendment are attached hereto in a page entitled, "Version with Markings to Show Changes Made."

The drawings have been objected to by the Examiner. In response, Applicants have attached additional drawings identified as Figures 4A and 4B. New Figures 4A and 4B are supported, for example, at Figures 1A and 1B, and at page 8, line 35 through page 9, line 13 in the specification. The specification has also been amended to identify these drawings. No new matter has been added.

The title and abstract have been objected to by the Examiner. Applicants have amended the title and abstract accordingly. The claims 15-20 have been objected to based on informalities. Minor editorial changes have been made to those claims to address those informalities. However, Applicants submit that these claims clearly limit steps in claim 14 and, therefore, do not require further amendment to recite method steps as suggested by the Examiner.

Claim rejections - 35 U.S.C. § 112, second paragraph

Claims 14-20 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants respectfully traverse this rejection; however, Applicants have made minor editorial changes to claims 14-20 taking into consideration the Examiner's comments. In this regard, claim 14 has been amended to more clearly recite the position from which the sealing resin is injected into the die. Applicants respectfully request reconsideration and withdrawal of this rejection.

Claim rejections - 35 U.S.C. § 103(a)

Claims 14-20 stand rejected as being unpatentable over U.S. Patent No. 5,349,238 ("*Ohsawa*") in view of U.S. Patent No. 4,857,483 ("*Steffen*"), and further in view of U.S. Patent No. 6,277,225 ("*Kinsman*"). Applicants respectfully traverse this rejection.

Independent claim 14 recites a method for manufacturing an electronic device. A first lead with an element placement pad, a second lead that is disposed at a distance from the element placement pad, and an electronic element placed on the element placement pad are placed within a die. A sealing resin is injected in a die, in a direction substantially parallel to a surface of the element placement pad, to seal the electronic element, the element placement pad, a part of the first lead, and a part of the second lead in a package.

Ohsawa discloses a semiconductor device including a lead frame. In particular, at Figure 1A, *Ohsawa* discloses a connection between an electrode pad 2, on a surface of a semiconductor element 1, and a lead frame 3. *Ohsawa*, however, does not disclose or suggest that an electronic element is placed on an element placement pad of a first lead as recited in claim 14 of the present application. For example, the semiconductor element 1 of *Ohsawa* is not placed on an element placement pad of a first lead, instead it is placed beneath electrode pad 2.

Steffen does not remedy the deficiencies of *Ohsawa*. *Steffen* discloses a method for encapsulating integrated circuits. *Steffen*, however, does not disclose or suggest that a sealing resin is injected in a die in a direction substantially parallel to a surface of the element placement pad, as recited in claim 14.

For the foregoing reasons, Applicants submit that independent claim 14 is allowable over the cited art.

Claims 15-19 depend from claim 14 and are believed allowable for the same reasons. Moreover, each of these dependent claims recites additional features in combination with the features of claim 14, and is believed allowable in its own right. Individual consideration of these dependent claims is respectfully requested.

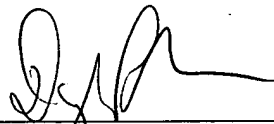
Claim 20 is also believed allowable over the cited art for the same reasons discussed above with respect to claim 14. *Kinsman* does not remedy the deficiencies of *Ohsawa* and *Steffen*. *Kinsman* discloses a "lead over chip" semiconductor die assembly. In particular, at Figures 5A and 5B, *Kinsman* discloses that a filler particle **130** is lodged in a space formed by dielectric adhesive **114** between a die **102** and a lead **112**. *Kinsman*, however, does not disclose or suggest the relationship between a particle diameter of a filler and the bending depth of a first lead, as recited in claim 20.

Therefore, Applicants submit that claim 20 is also allowable over the cited art.

In view of the above, favorable reconsideration in the form of a notice of allowance is requested.

Respectfully submitted,

MERCHANT & GOULD P.C.
P.O. Box 2903
Minneapolis, Minnesota 55402-0903
(612) 332-5300



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Douglas P. Mueller
Reg. No. 30,300
DPM:DTL

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Title

The Title has been amended as follows: METHOD FOR MANUFACTURING RESIN
SEALED ELECTRONIC DEVICE

In the Specification

The following paragraph has been added at page 7, line 20 as the final paragraph in the
Brief Description of the Drawings:

Fig. 4 is a drawing that shows the general construction of an example of the first
embodiment of an electronic device according to the present invention, (A) being a cross-section
view thereof, and (B) being a cross-section view thereof, as seen from the direction indicated by
the arrows along the line 4B shown in (A).

The paragraph beginning at line 35 of page 8 has been amended as follows:

The position of the sealing resin injection port 90 in this embodiment, as shown by the
double-dot-dash line in Fig. 1, and as shown in Figures 4A and 4B, is preferably on a longer side
of the package, offset from the center thereof [forward] towards one of the shorter sides,
avoiding the bonding wires 50, with sealing resin being injected therethrough in the direction
shown by the arrow in Fig. 1 and by direction arrow 93 in Fig. 4B, in order to prevent the
bonding wires 50 from toppling by injection pressure of the sealing resin acting on the side
surfaces of the bonding wires 50 directly. By making the resin package small, it would be
difficult as done in the past to provide a resin injection port on a shorter side of the package.
Additionally, because the spacing between the inner wall of the resin die, shown in Figs. 4A and

4B as upper die 91 and lower die 92, and the inner lead becomes narrow, it would be difficult to cause resin to sufficiently fill in under the inner lead. For this reason, by injecting sealing resin, as noted above, from a longer side at a position that is offset [forward] toward one of the shorter sides of the package, the resin fills into the die smoothly, thereby preventing problems with insufficient resin filling.

In the Abstract

The Abstract has been replaced with the following rewritten paragraph:

A method for manufacturing an electronic device by placing within a die a first lead with an element placement pad, a second lead, and an electronic element placed on the element placement pad. The electronic element, the element placement pad, a part of the first lead, and a part of the second lead are sealed in a package by injecting a sealing resin in the die from a position on a longer side of the package, with the position being offset toward one shorter side thereof. The first lead is bent in an S shape, with a bending depth being at least as large as the thickness of the first lead. A thickness of the resin on a non-device side of the element placement pad is smaller than the bending depth.

In the Claims

Claims 14 - 20 have been amended as follows:

14. (Amended) A method for manufacturing an electronic device comprising:

placing within a die a first lead with an element placement pad having a thickness t of less than 0.1 mm, a second lead that is disposed at a distance from said element placement pad, and an electronic element placed on said element placement pad; and

sealing in a package said electronic element, said element placement pad, a part of said first lead, and a part of said second lead by injecting a sealing resin, in a

direction substantially parallel to a surface of said element placement pad, in the die from a position on a longer side of the package, said position being offset toward one shorter side thereof.

wherein said first lead is bent in an S shape, a bending depth d therefore being at least as large as the thickness t of said first lead, and a thickness T of said resin on a non-device side of said element placement pad is smaller than said bending depth d .

15. (Amended) The [A] method according to claim 14, wherein the spacing between said element placement pad and said second lead is no greater than 0.12 mm.
16. (Amended) The [A] method according to claim 14, wherein the vertical, horizontal and height outer dimensions of said sealing resin are each no greater than 1.0 mm.
17. (Amended) The [A] method according to claim 14, wherein widths of inner lead parts of said first and second leads within said sealing resin are substantially uniform.
18. (Amended) The [A] method according to claim 14, wherein the thickness of said electronic element is substantially the same as the thickness t of said first lead.
19. (Amended) The [A] method according to claim 14, wherein a bending radius R on an outer surface of a bent part of said first lead near a bottom surface of said sealing resin is at least 0.05 mm and is no greater than the lead thickness t .
20. (Amended) The [A] method according to claim 14, wherein the sealing resin contains a filler, whose particle diameter is not greater than half the bending depth d of the said first lead.